151222126 - Engineering Graphics

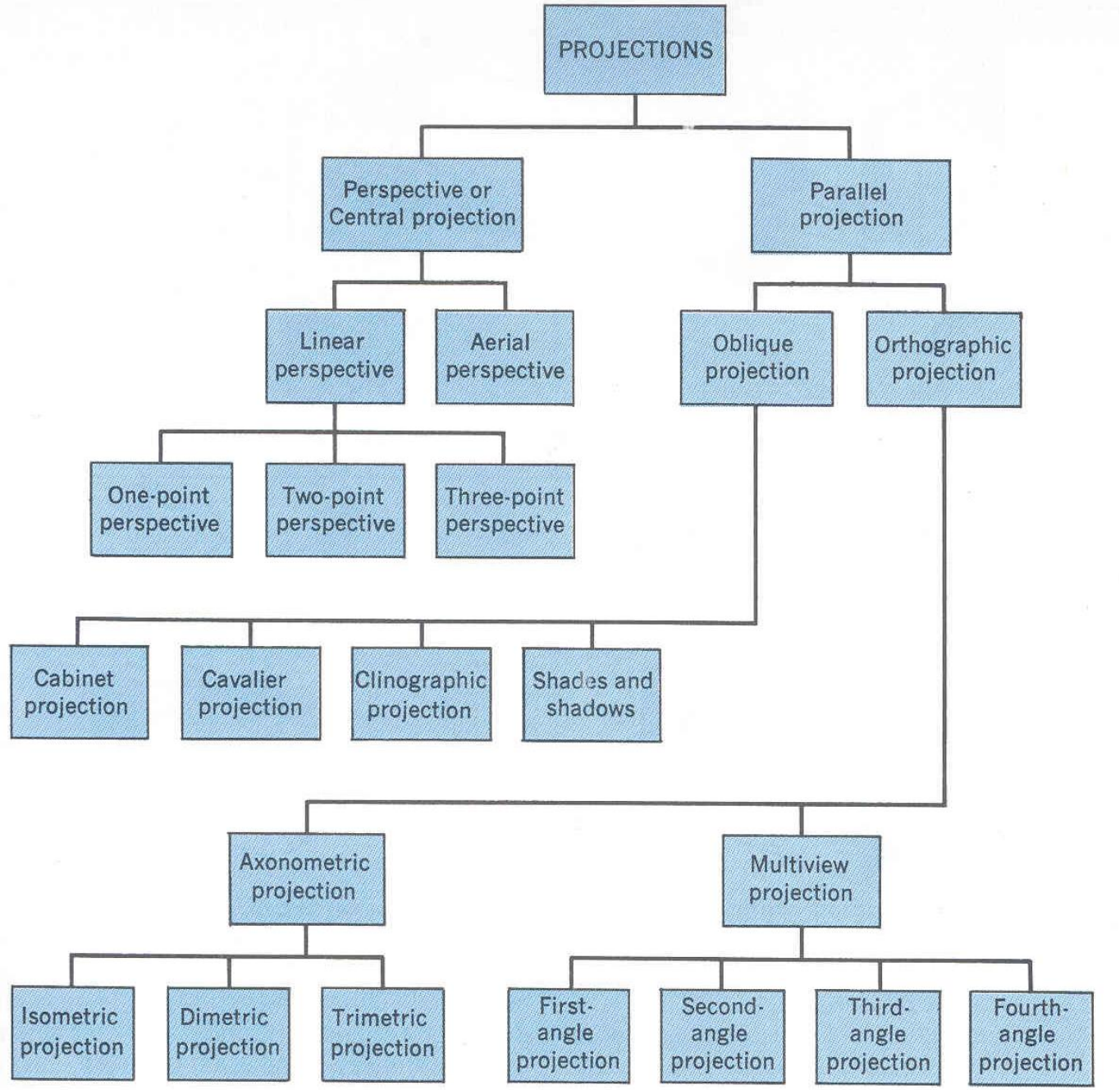
Lecture 2

Projections

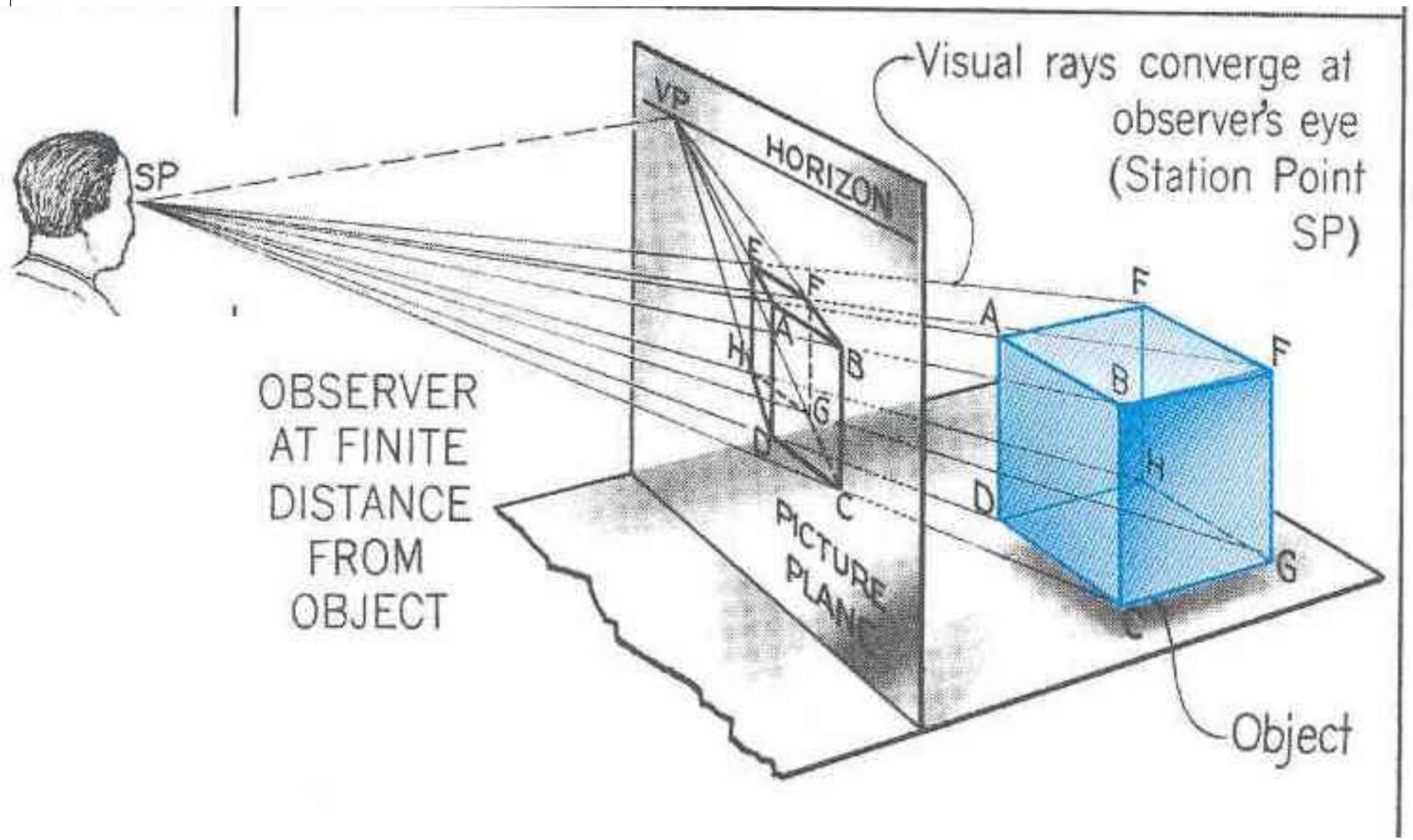
Projections

- A view of an object is called a projection.

- By projecting multiple views from different directions in a systematic way you can completely describe the shape of 3-D objects.


PROJECTIONS
Perspective or Central projection
Parallel projection
Linear perspective
Aerial perspective
Oblique projection
Orthographic projection
One-point perspective
Two-point perspective
Three-point perspective
Cabinet projection
Cavalier projection
Clinographic projection
Shades and shadows
Axonometric projection
Multiview projection
Isometric projection
Dimetric projection
Trimetric projection
First-angle projection
Second-angle projection
Third-angle projection
Fourth-angle projection

Perspective Projection



Linear Perspective

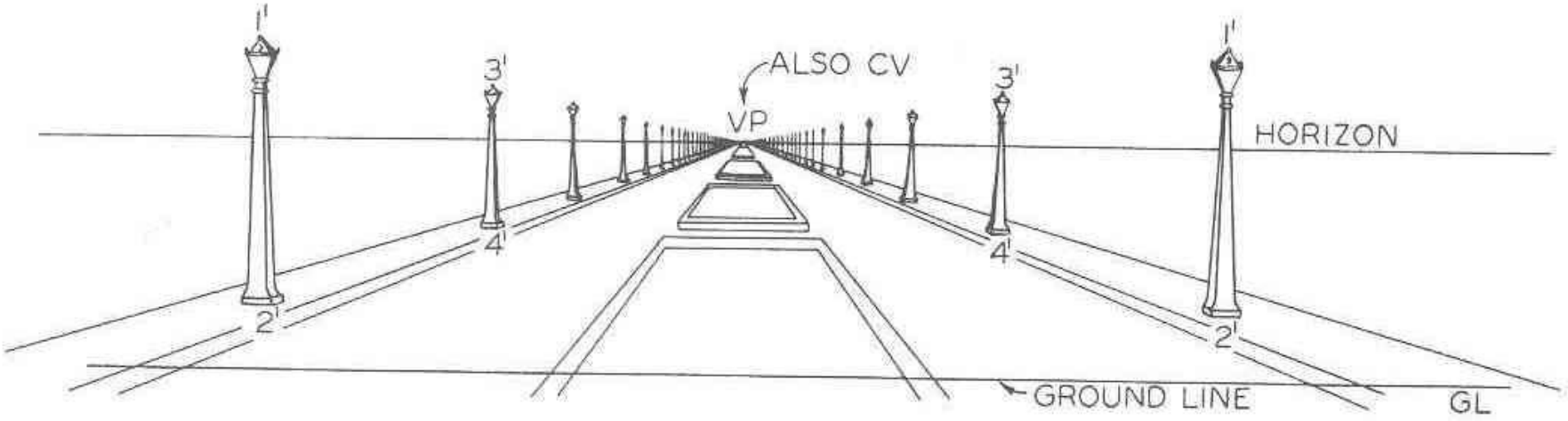
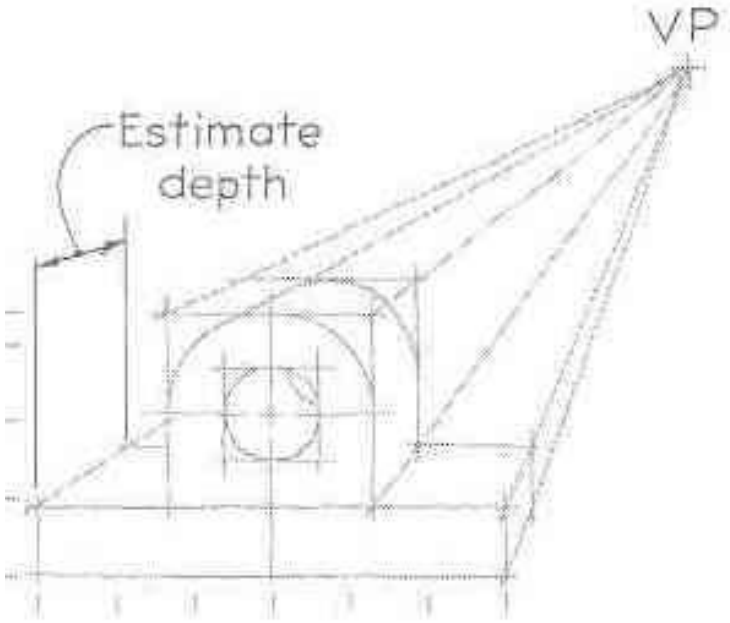
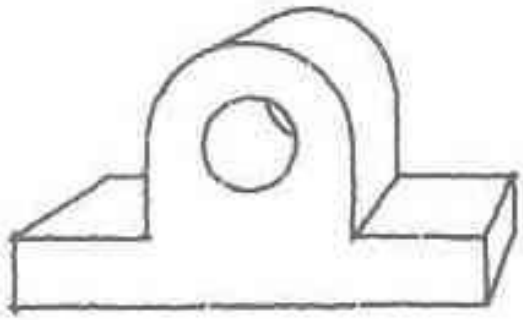


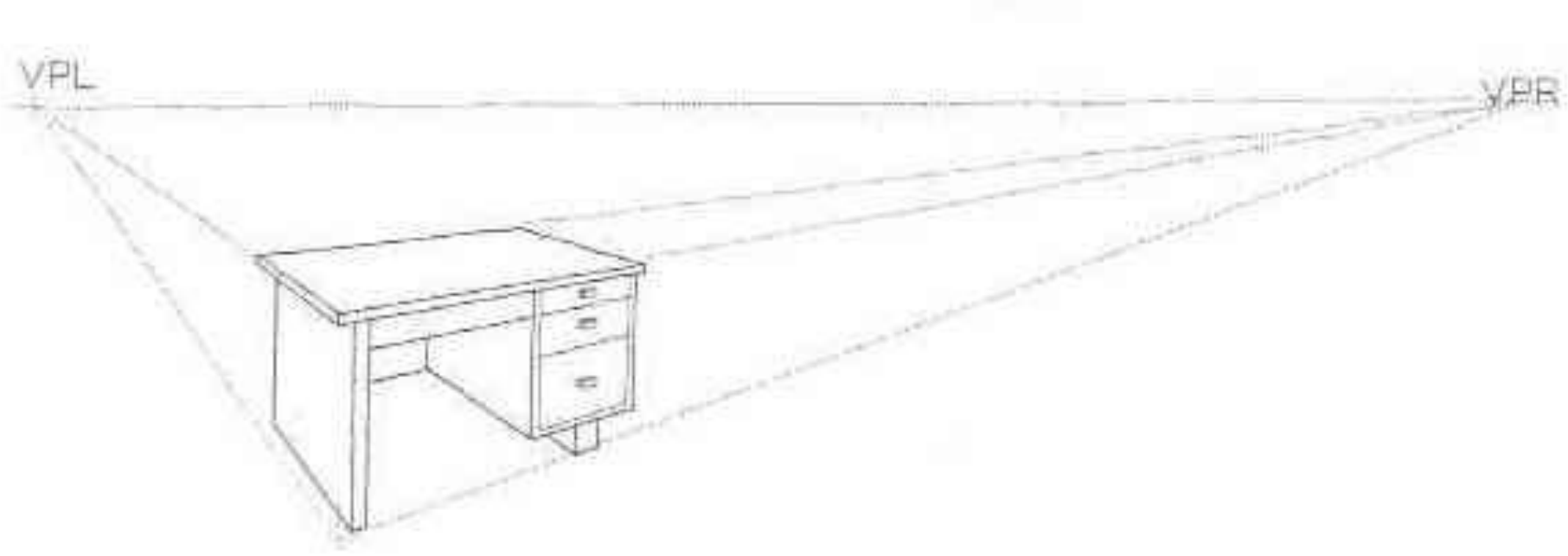
FIGURE 6.33 A Perspective.

One-point Perspective





Two-point Perspective

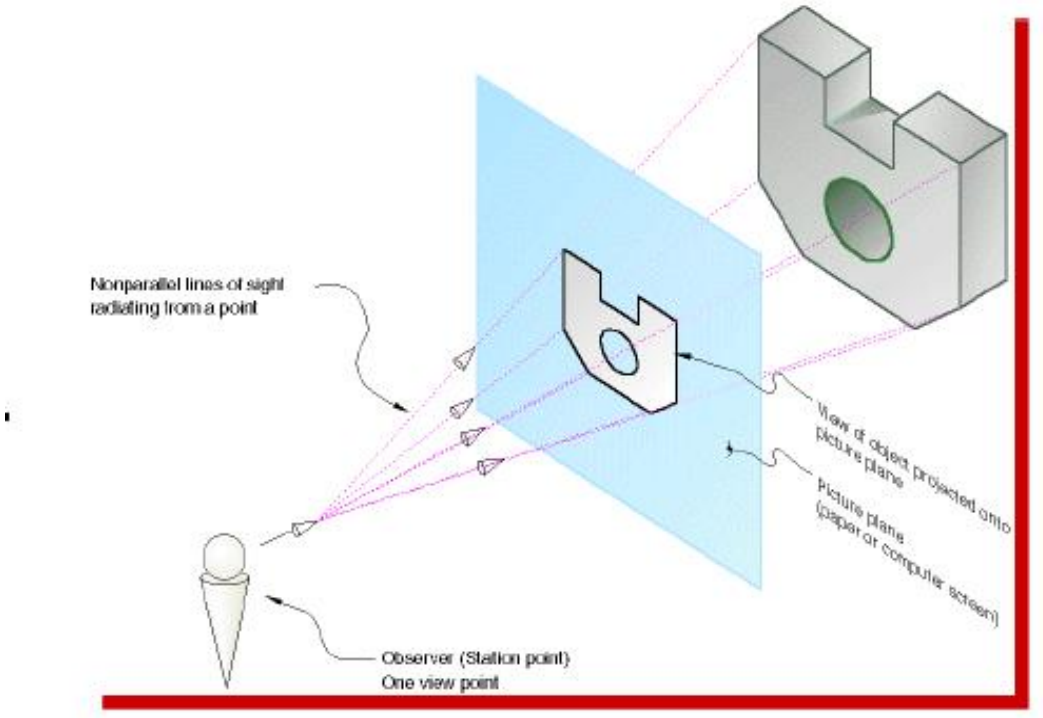


Projections

- Conical projection
- Parallel projection
  1. Oblique projection
  2. Orthographic projection
     - Axonometric projection
     - Perpendicular projection

Conical Projection

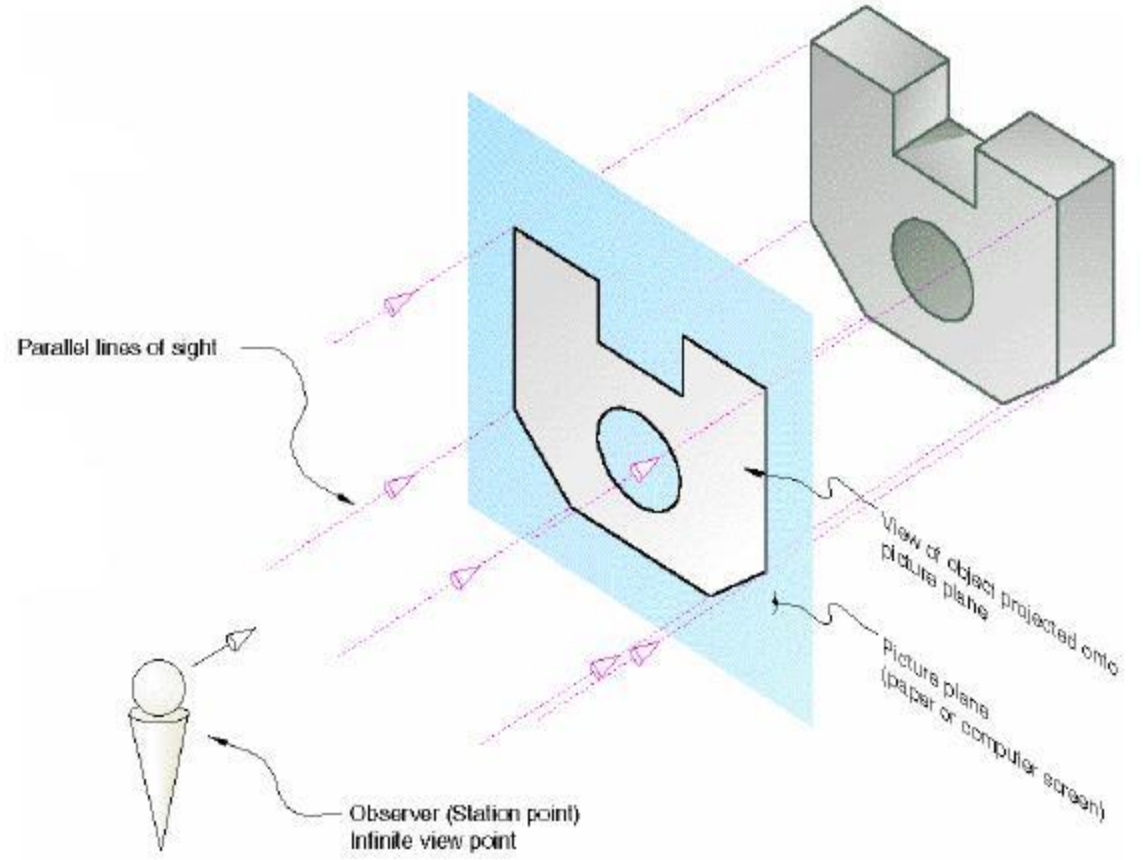
- In this method, the light source is thought as a point.
- Generally used for architectural drawing.



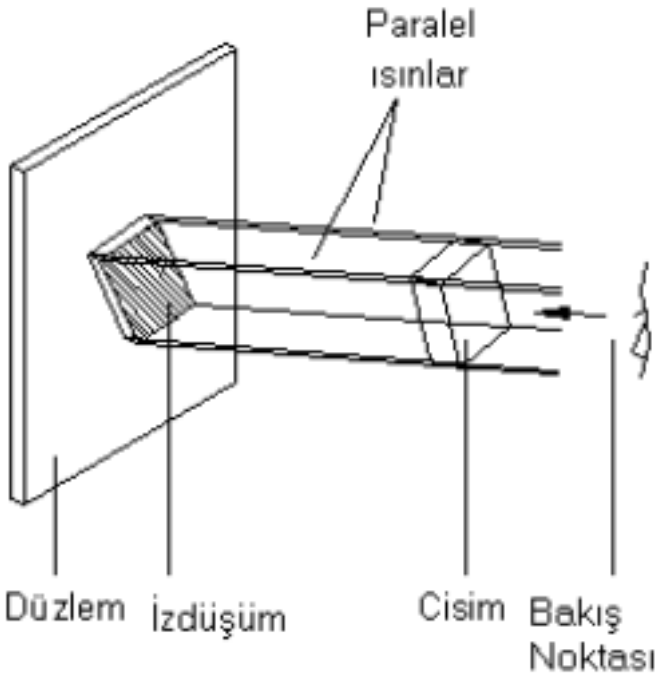
Parallel Projection

- The rays of the light source is assumed to be parallel to each other.
- The light source is assumed at infinity.
- Generally used for technical drawing of machine parts.

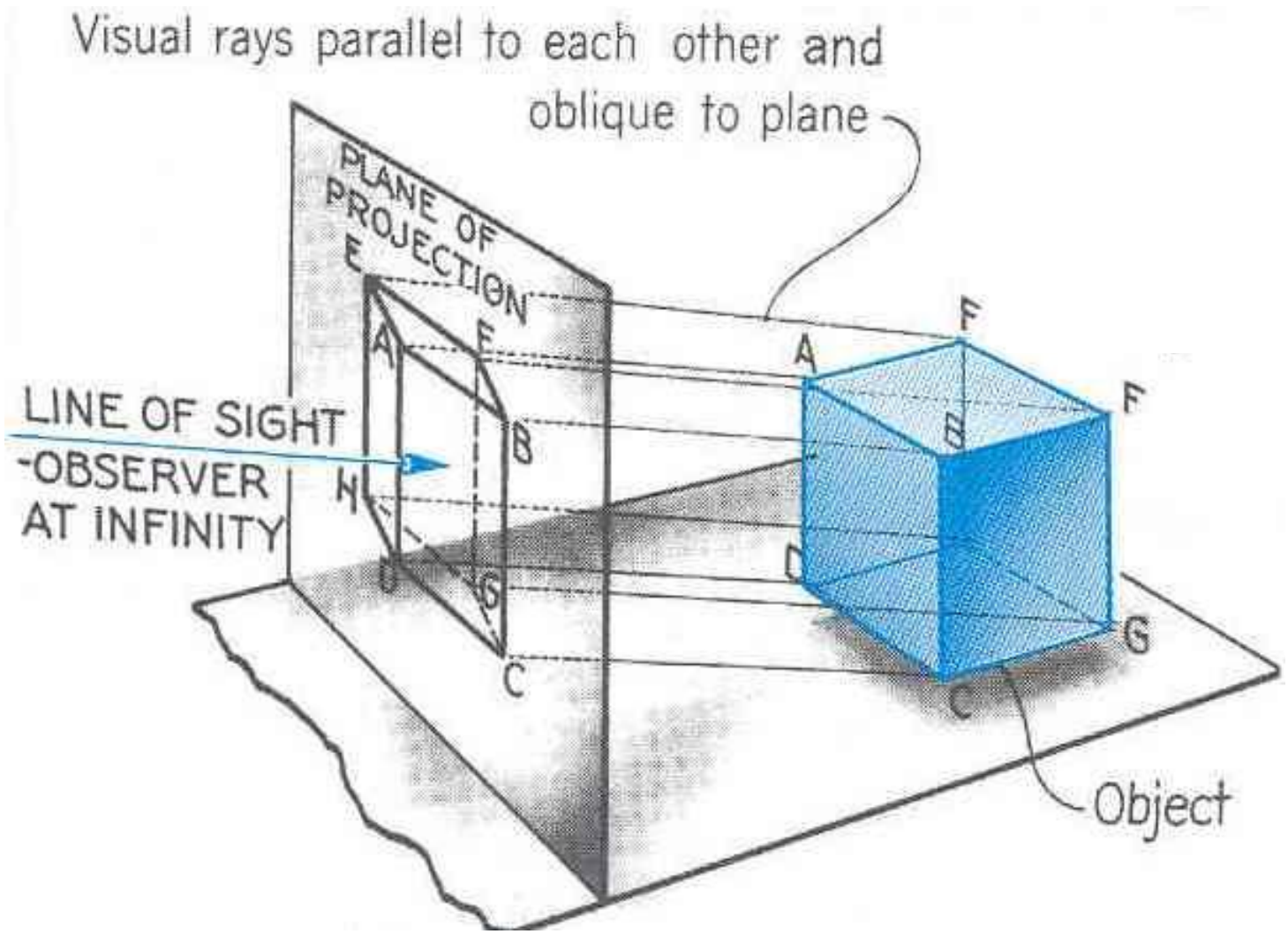
Parallel Projection



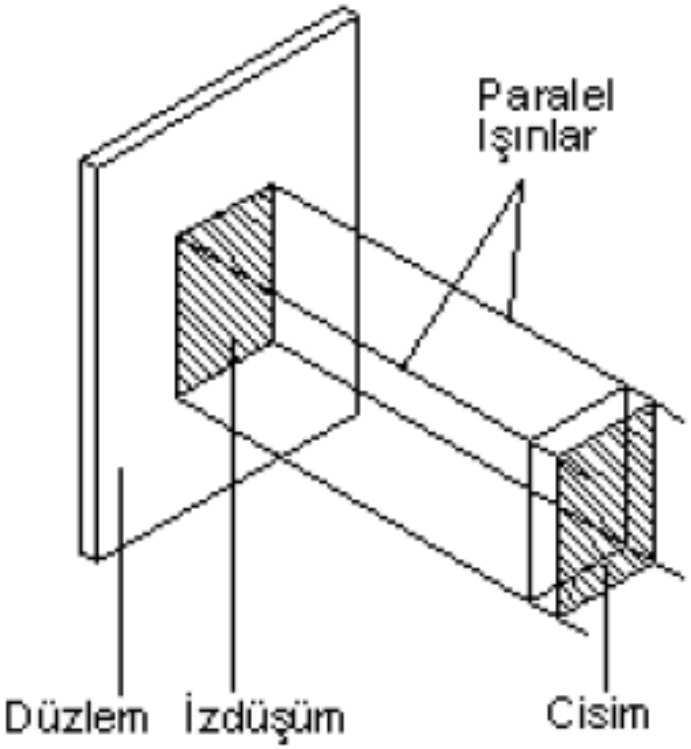
Oblique Projection



Oblique Projection



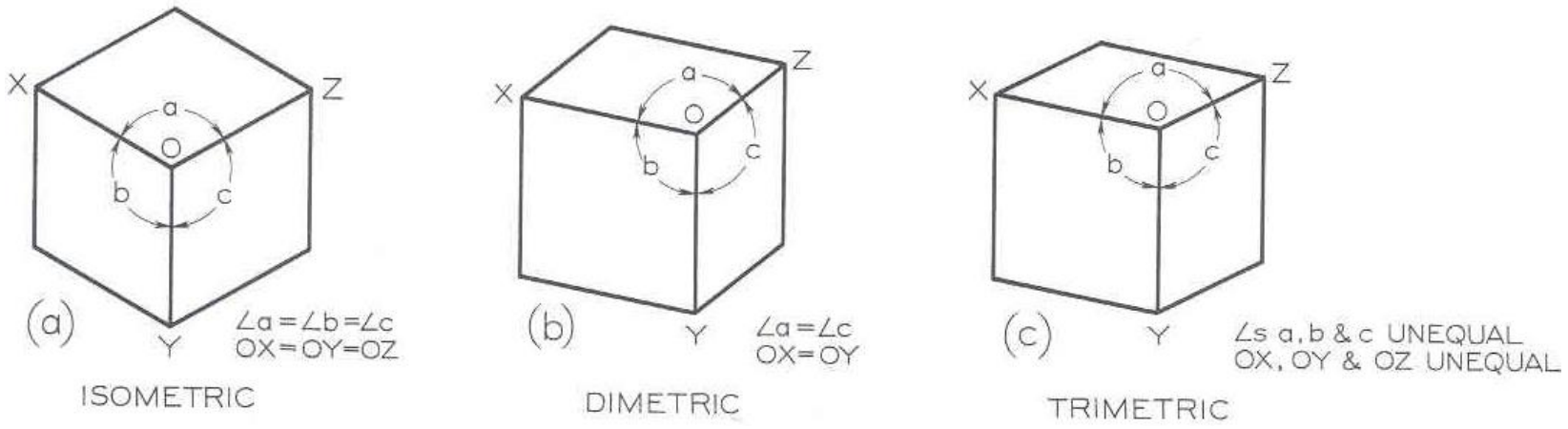
Orthographic Projection



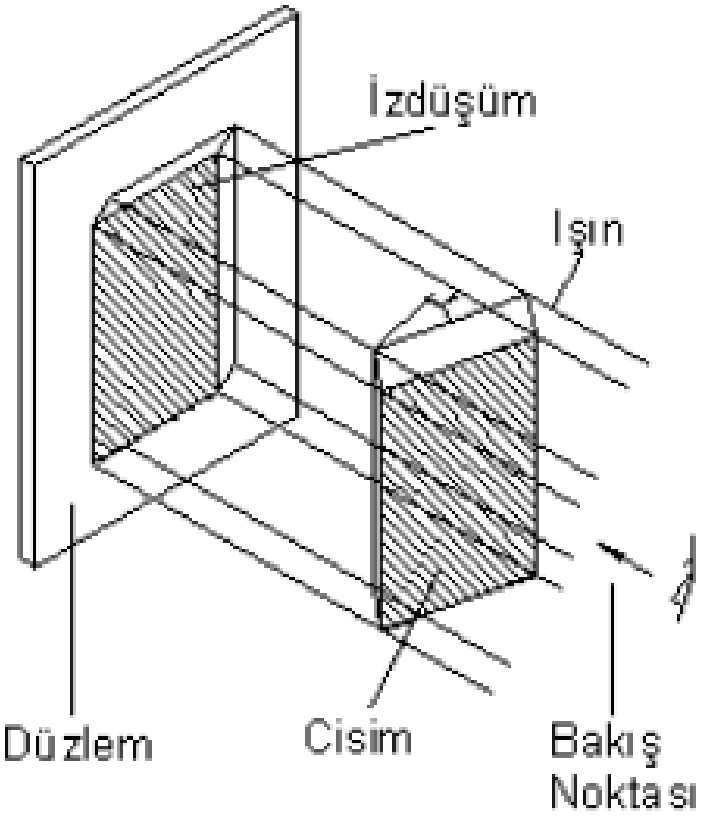
Axonometric Projection

- Projection rays are perpendicular to the plane.
- Object is oblique to the plane.
- Isometric Projection; all axes equally foreshortened
- Dimetric Projection; two axes equally foreshortened
- Trimetric Projection; all three axes foreshortened differently, requiring different scales for each axis.

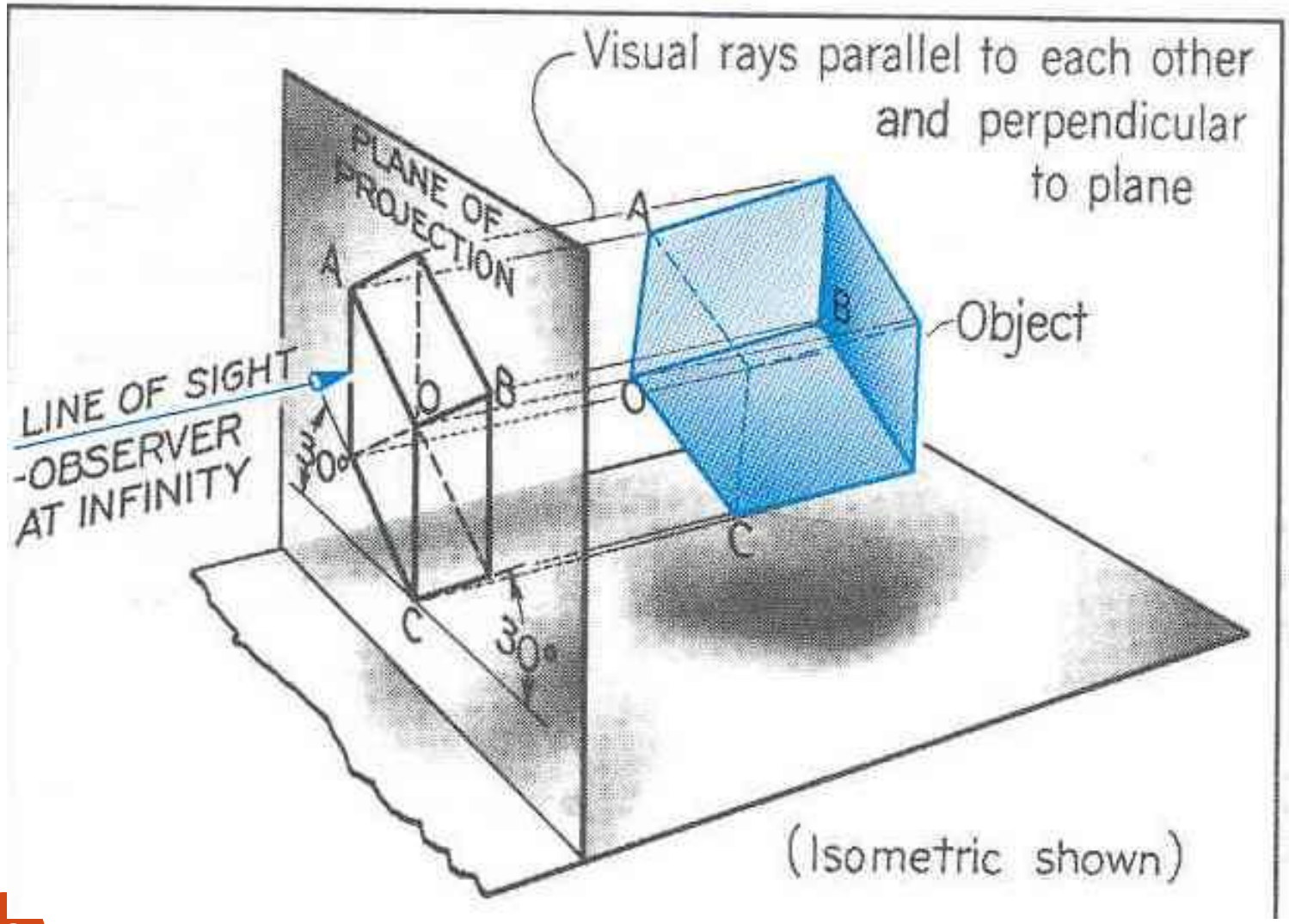
Axonometric Projection



Axonometric Projection



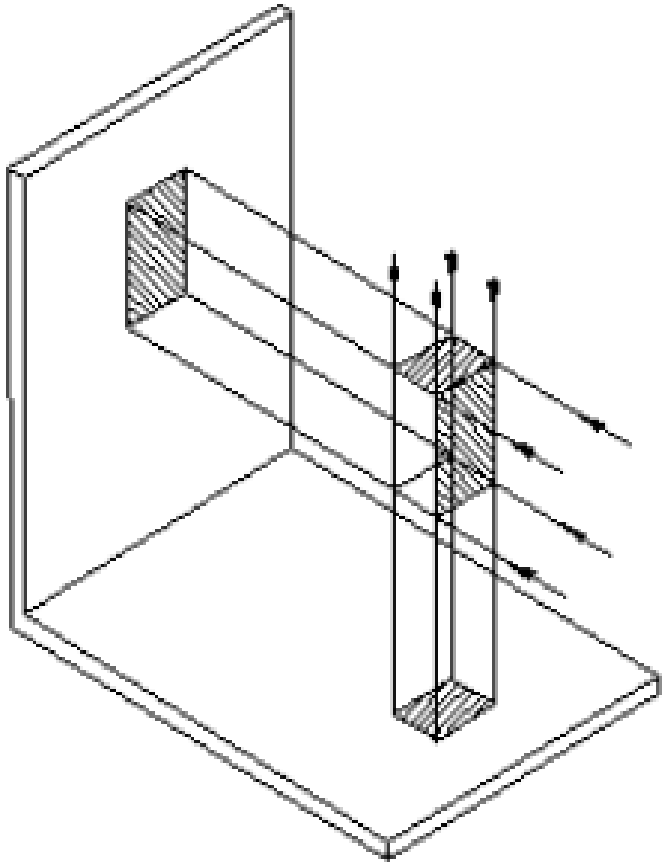
Axonometric Projection



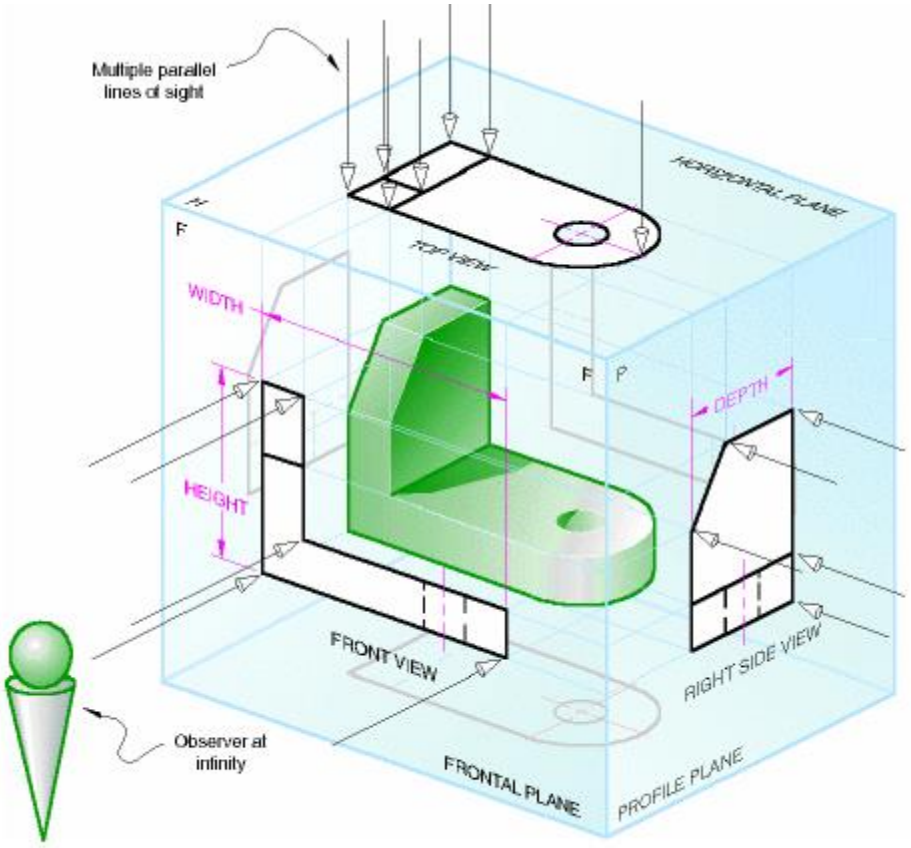
Perpendicular Projection

- Projection rays are perpendicular to the plane.
- Some surfaces of the object are perpendicular to the plane and some surfaces of the object are parallel to the plane.
- Object size is actual size

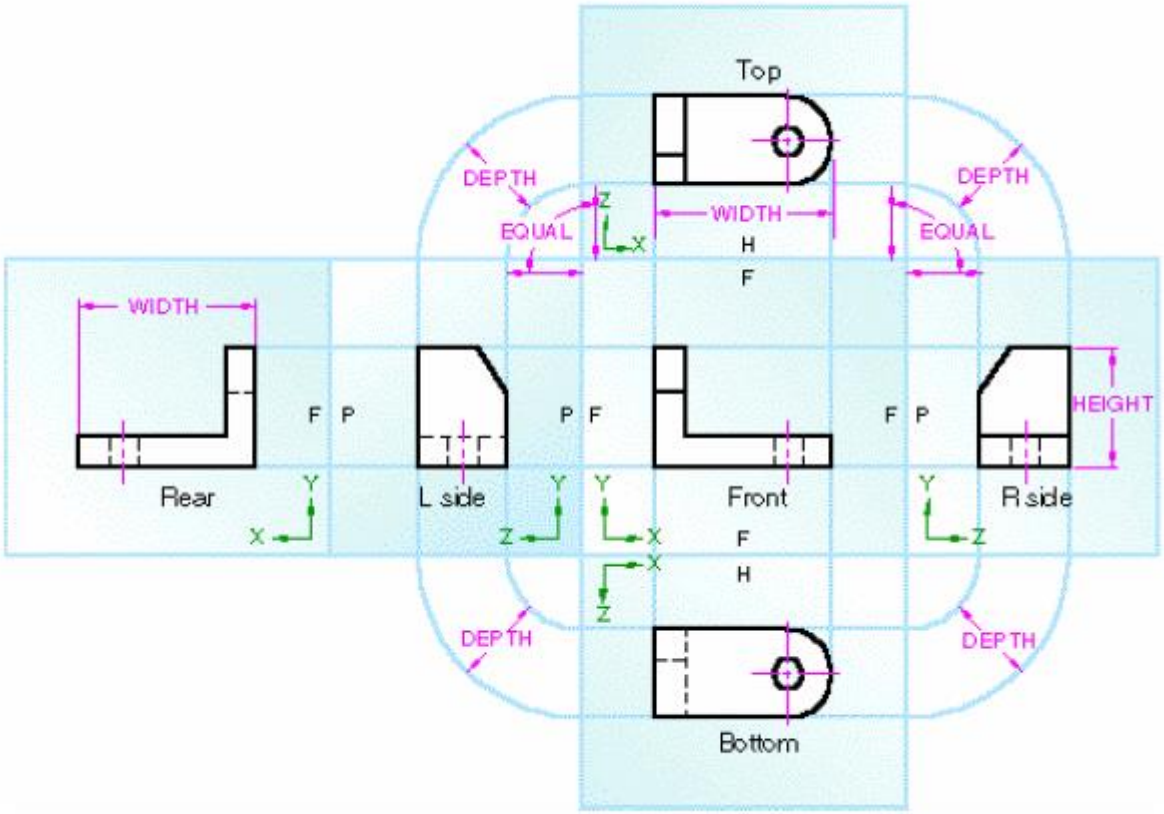
Perpendicular Projection



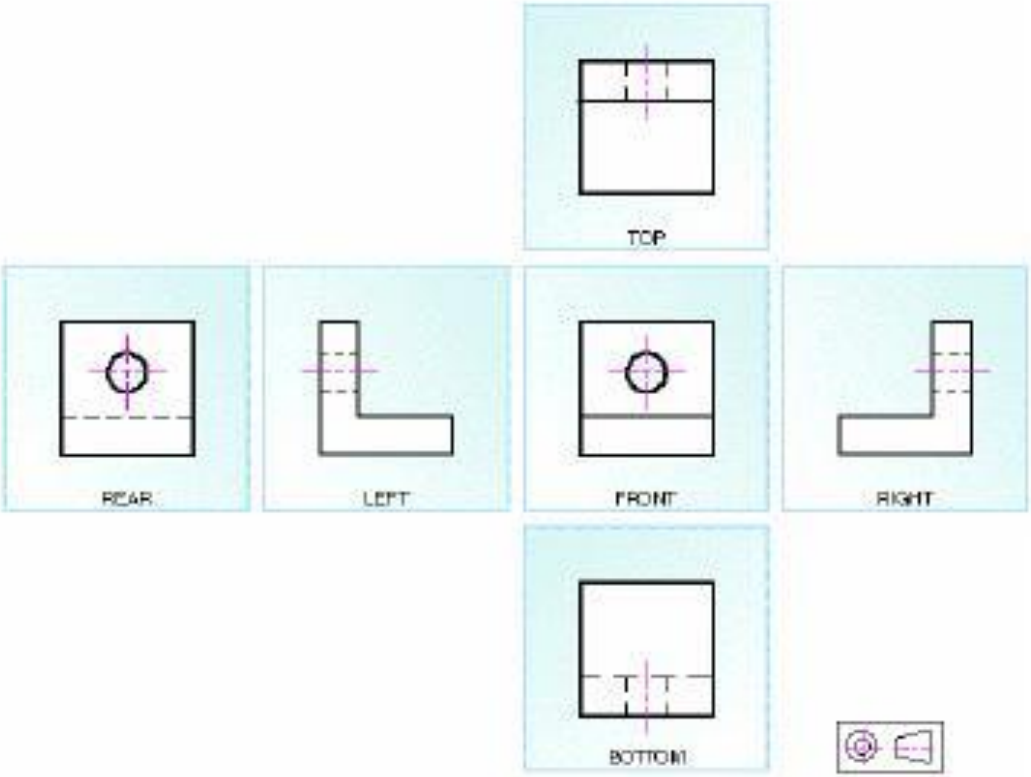
3 Projection Plane



Epür

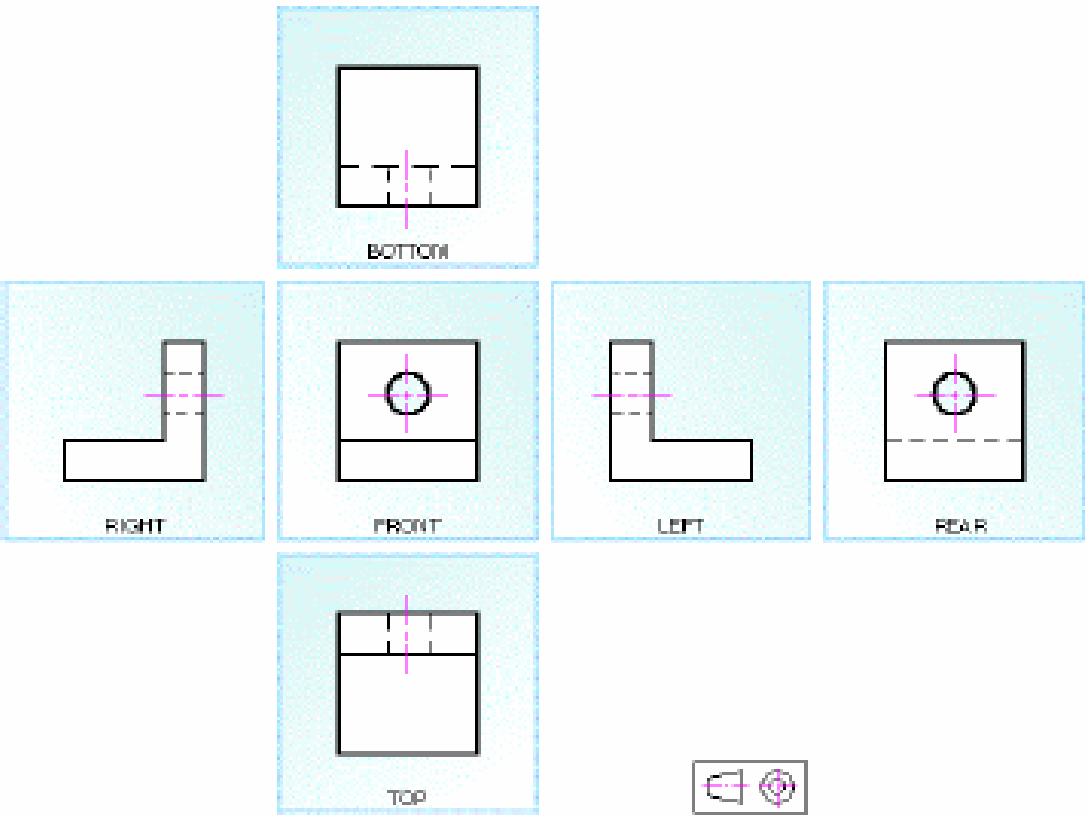

Top
DEPTH
EQUAL
Z
X
WIDTH
H
F
DEPTH
EQUAL
WIDTH
F P
P F
F P
HEIGHT
Rear
L side
Front
R side
Y
X
Z
F
H
DEPTH
DEPTH
Bottom

Epür (3RDAngle (US Standard))



(A) U.S. Standard

Epür (1STAngle (ISO Metric Standard) European standard)

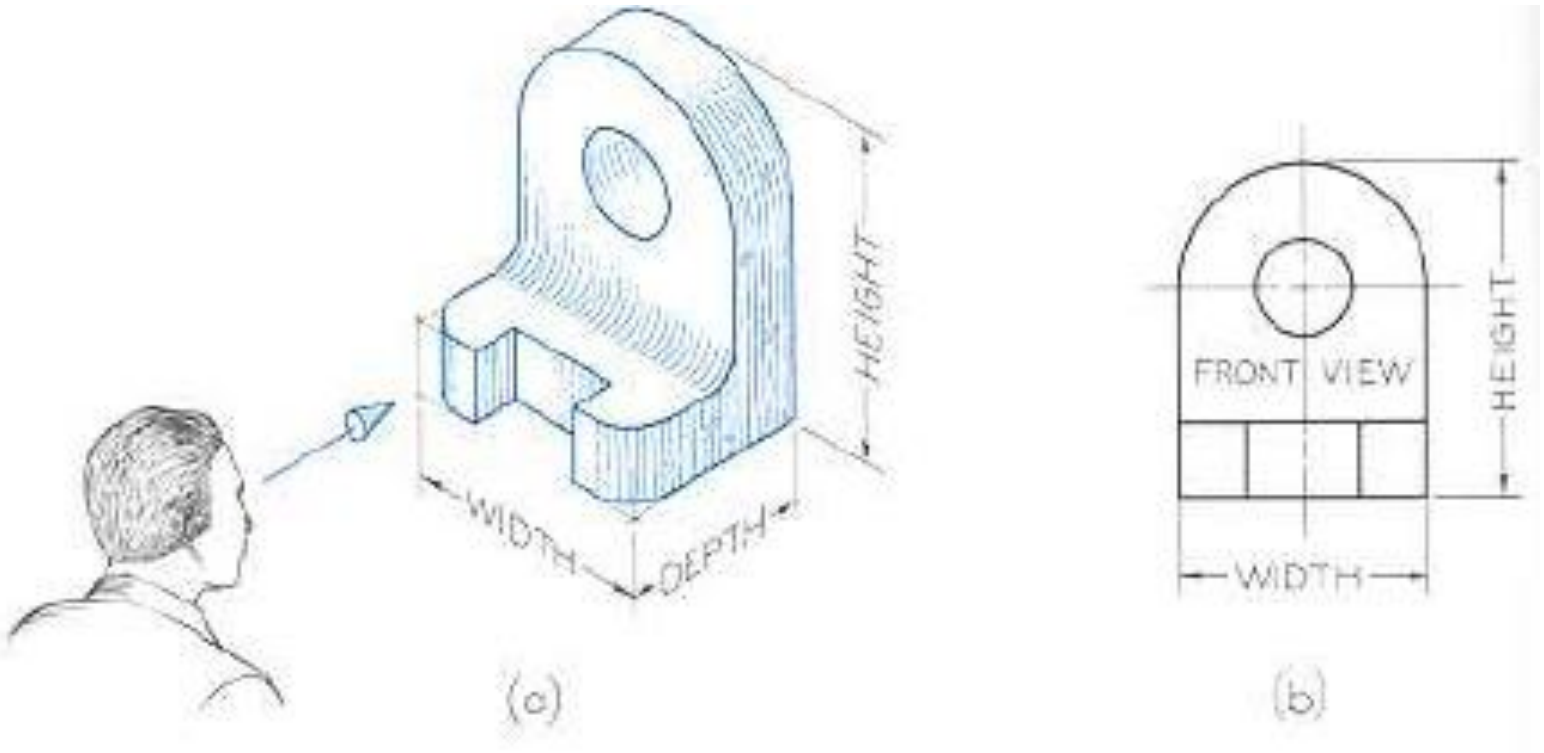


(B) European Standard

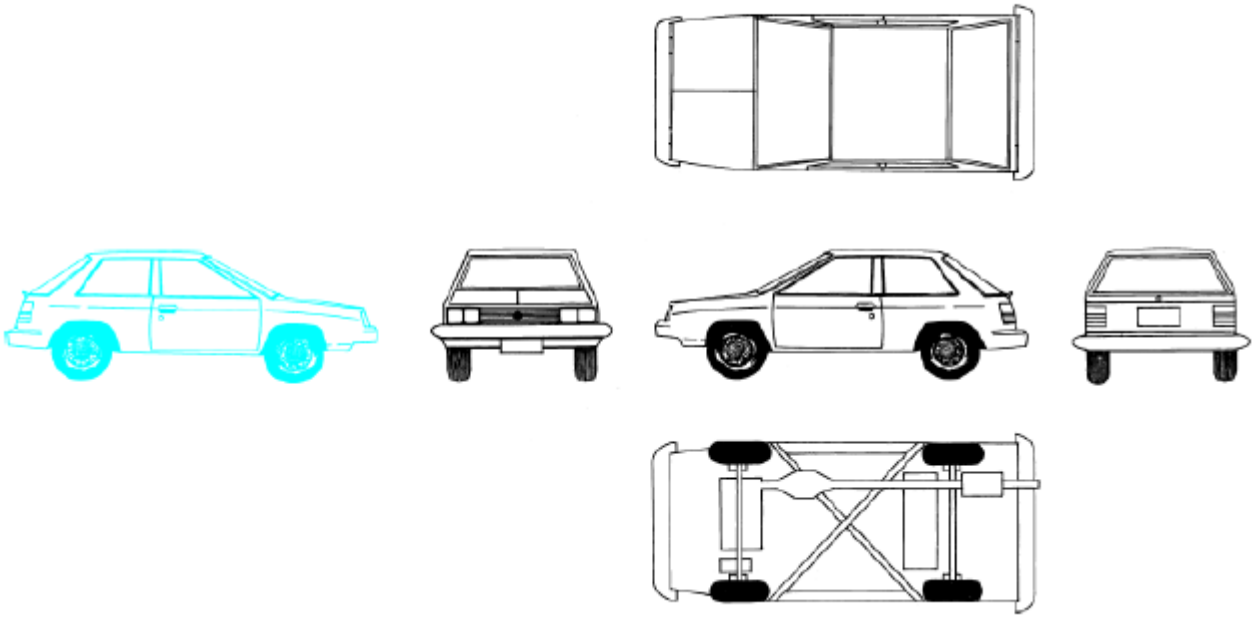
The Six Standard Views

- Any object can be viewed from six mutually perpendicular directions
- Three of the views are aligned with the other three and show esentially the same information about the object, except that they are viewed from the exact opposite direction.
  - Top view – Bottom view
  - Left-side view – Right-side view
  - Front view – Rear view

Front view of an Object



The Six Standard Views of a Compact Automobile



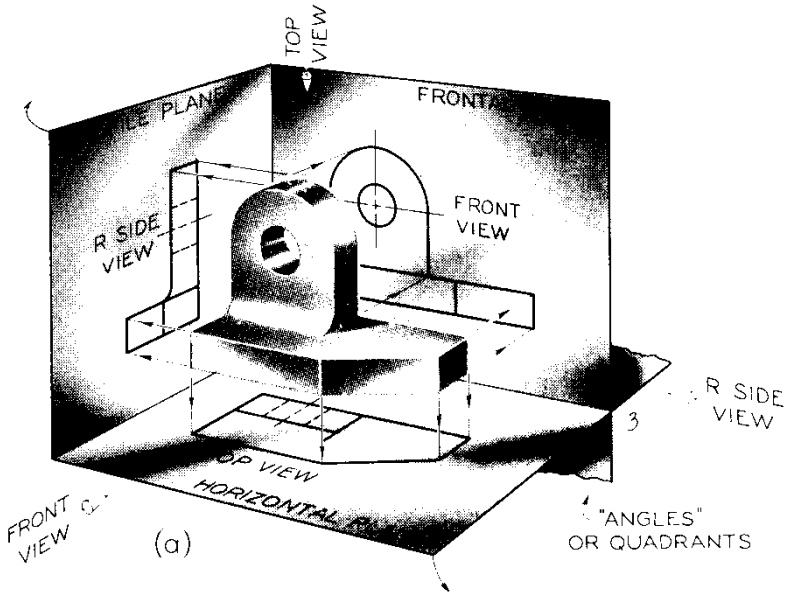
Standard Arrangement of Views

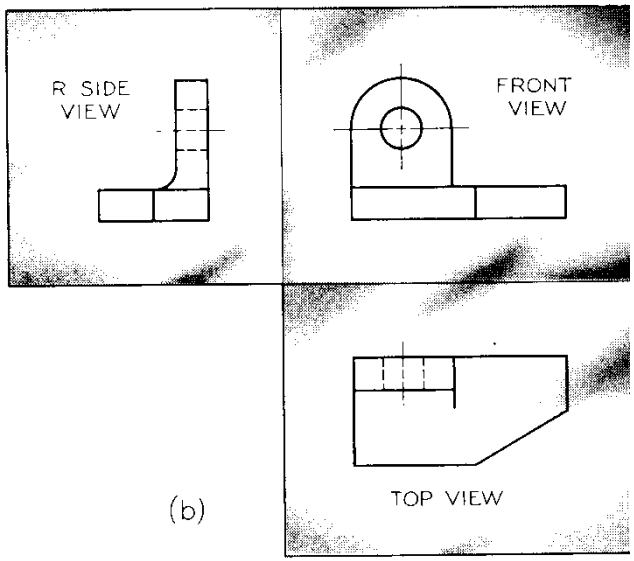
- The top, front, and bottom views align vertically.
- The rear, left-side, front, and right-side views align horizontally.
- To draw a view out of place is a serious error.

PRINCIPAL DIMENSIONS

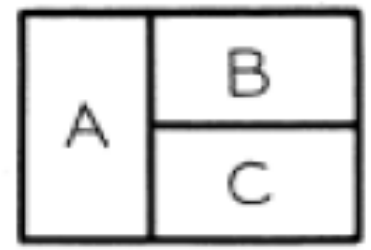
- The three principal dimensions of an object are
  - Width
  - Height
  - Depth
- Any principal view of a 3-D object shows only two of the three principal dimensions; the third is found in an adjacent view.

Fig. 6.47 **First-Angle Projection.**



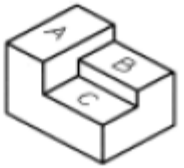


Similar Objects



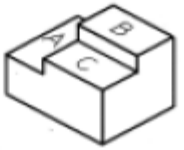
TOP VIEW

- Surface B is highest, and C and A are both lower

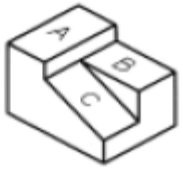


: or more surfaces is
ndrical

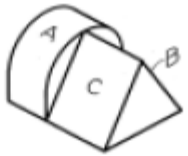
: or more surfaces is inclined



rface A is highest, and sur
es B and C are lower



- Surface A is highest and B is lower than C



Styles of Lines

Each line on a technical drawing has a definite meaning. Drawings use two different line widths—thick and thin—and different line styles indicate the meaning of the line.

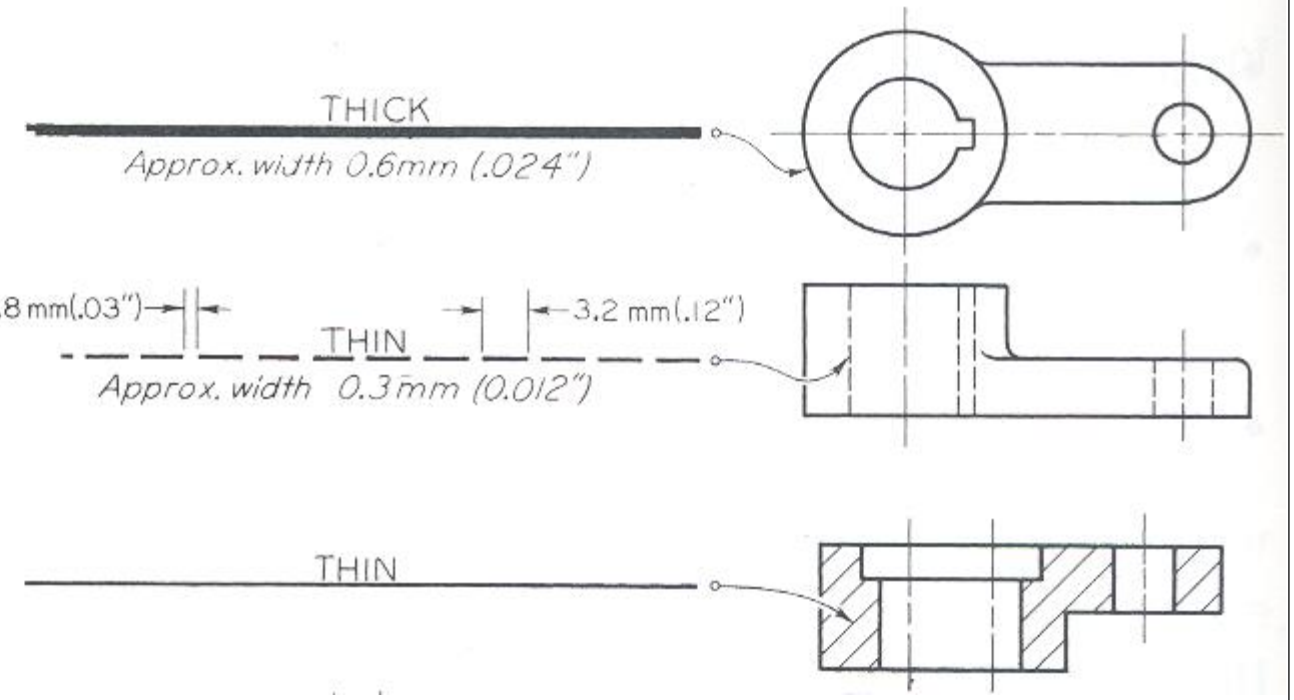
A person reading a drawing depends on line styles to communicate whether a line is visible or hidden, if it represents a center axis, or if its purpose is to convey dimension information.

To make your drawings clear and easy to read, make the contrast between the two widths of lines distinct.

Thick lines such as visible lines and cutting plane lines should be twice as thick as thin lines. Thin lines are used for construction lines, hidden lines, dimension lines, extension lines, center lines, and phantom lines.

Styles of Lines

Visible line



Hidden line

Section line

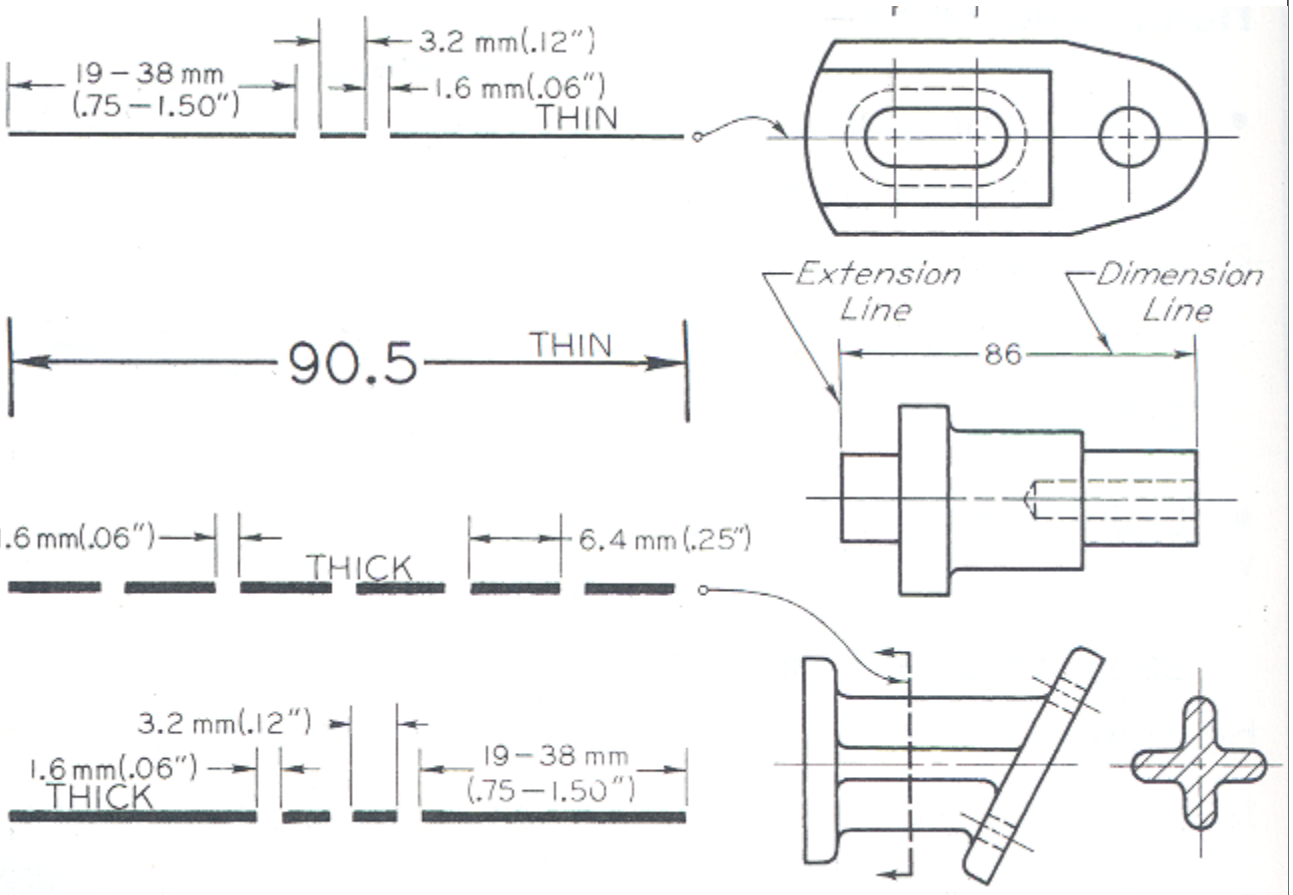
Styles of Lines

Center line

Dimension line,
Extension line,

Leaders

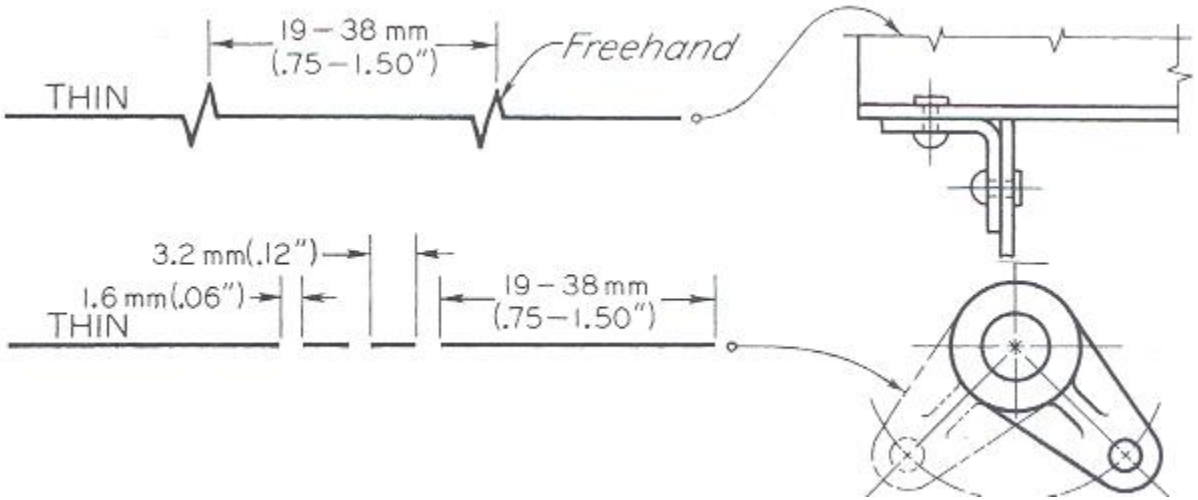
Cutting-plane
or
Viewing-plane
lines



Styles of Lines

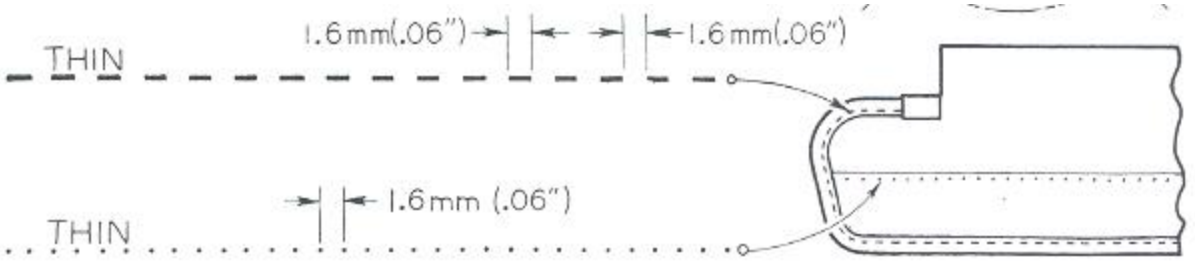
Long-break line

Phantom line

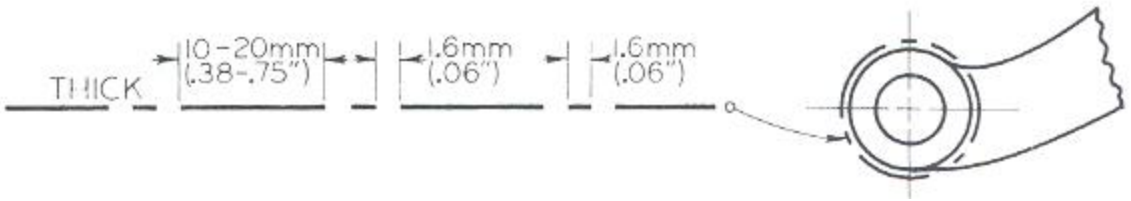


Styles of Lines

Stitch lines



Chain line



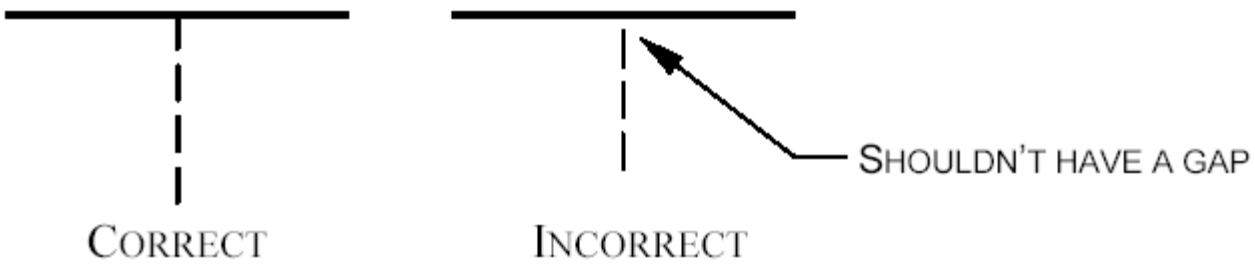
Line Weight:

All lines on a drawing should be equally dark with the exception of construction lines which should be barely visible at arms length. Hidden and center lines have the same width. Object lines should be thicker. Dimension and witness lines should be thin lines. Cutting plane lines should be thick phantom lines. Crosshatching lines should be thin and parallel. The spacing of cross-hatching lines should be consistent.

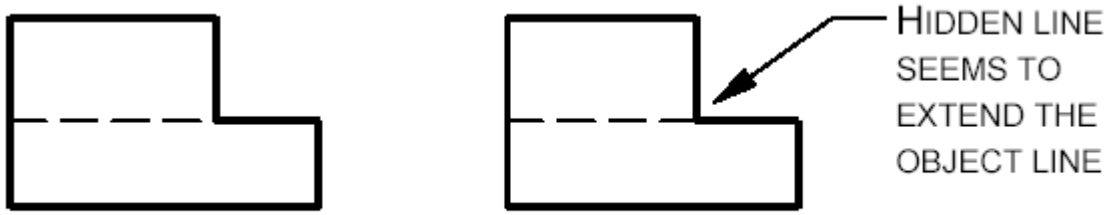
Hidden Line Conventions:

Hidden lines are shown on drawing views to represent hidden edges or contours. They are made as a series of dashes, approximately 1/8" long, separated by gaps that are approximately 1/16" long. The following rules should be followed when making hidden lines:

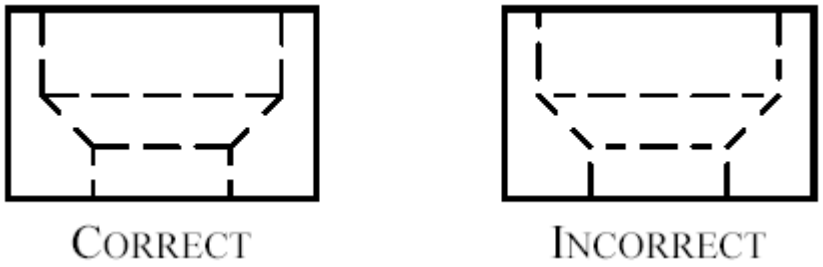
1. Hidden lines should nearly intersect with visible lines at the edge of an object.



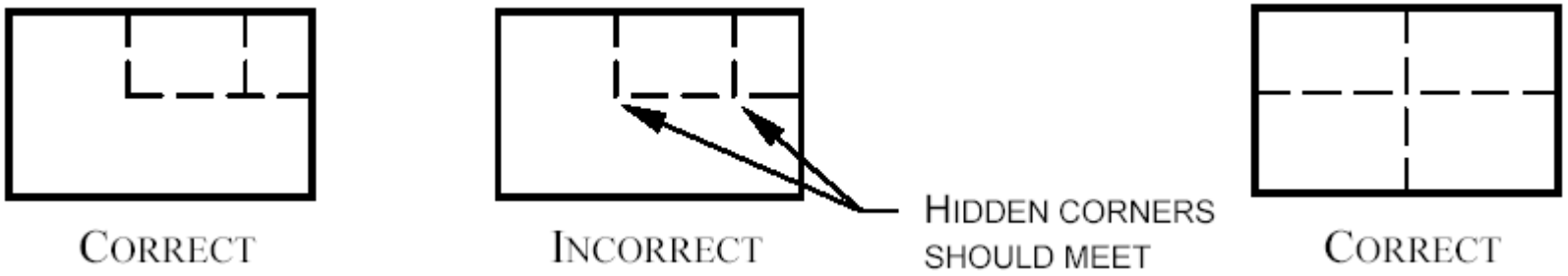
2. Hidden lines should not appear to be a continuation of a collinear object line. This is also true with curved hidden lines and curved object lines.



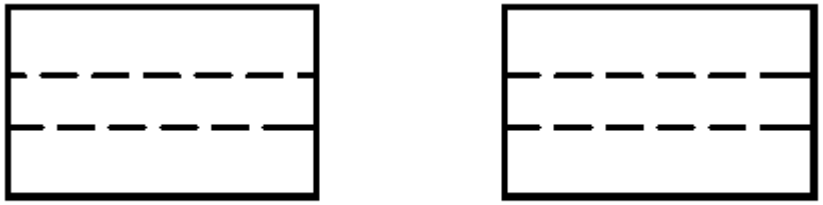
3. Hidden lines should meet when two or more come together at one point.



4. Hidden lines make T and L corners where they meet. Hidden lines should not form a cross (+) if the surfaces do not intersect.

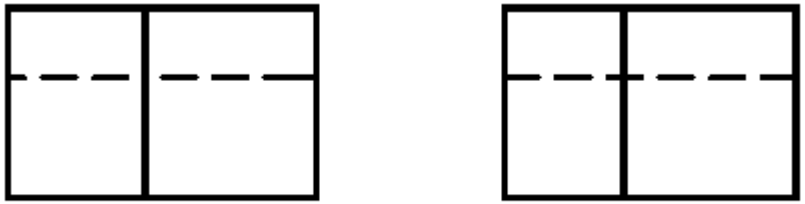


5. Parallel hidden lines should be drawn with a staggered pattern similar to a brick pattern.



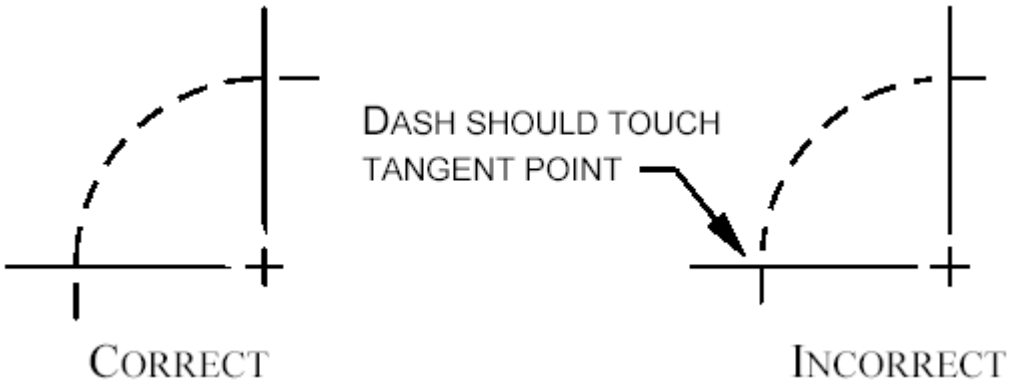
CORRECT INCORRECT

6. Hidden lines should appear to "jump" over object lines when possible.



CORRECT INCORRECT

7. Hidden line arcs should begin and end with a dash touching the tangent points with other features.



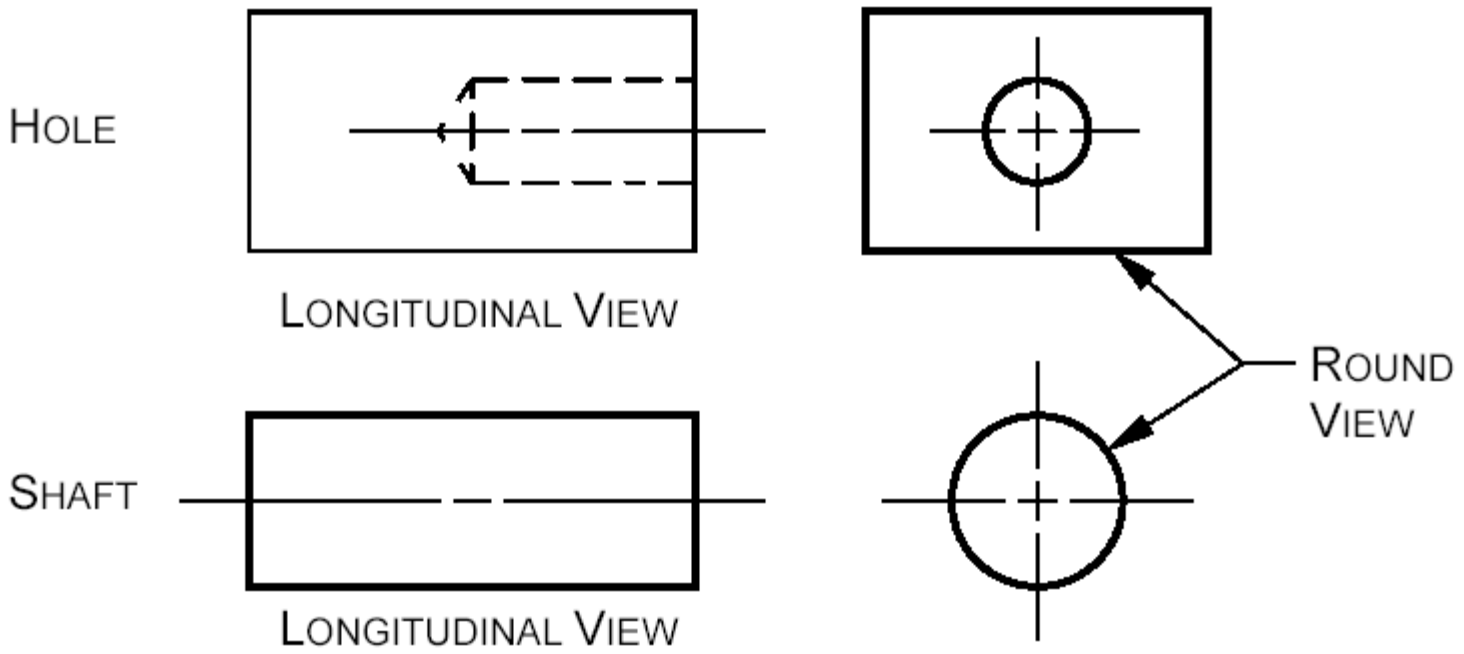
CORRECT INCORRECT

Center Line Conventions:

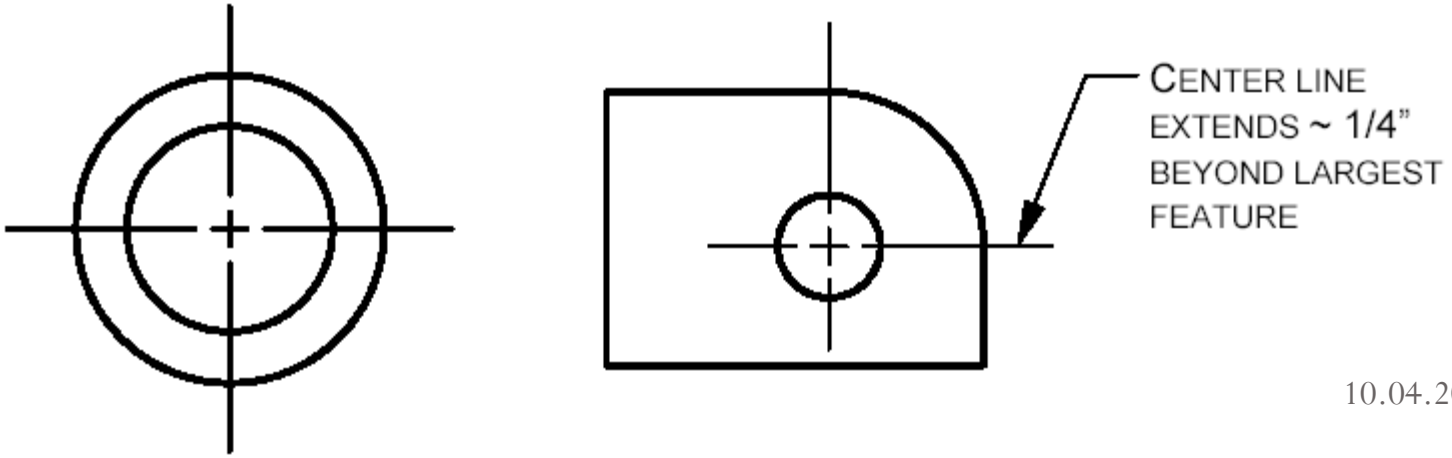
Centerlines are used to represent the axis of symmetry for symmetric parts or features. They also are used to represent bolt circles and paths of motion. The centerline is characterized by a long line, a short dash, and another long line.

"Centerlines are used mainly for dimensioning and should be omitted from unimportant rounded or filleted corners and other shapes that are self-locating". 1 Center lines typically extend approximately 1/4" beyond a round feature, except when used as an extension line in dimensioning. In this case, they are extended as necessary. The following rules should be followed when making centerlines:

1. Use a single centerline in the longitudinal view of round features (holes or solid cylinders) and crossing centerlines in the round view. The dashes should intersect at the center of the round feature. Note that centerlines extend approximately 1/4" beyond the feature.



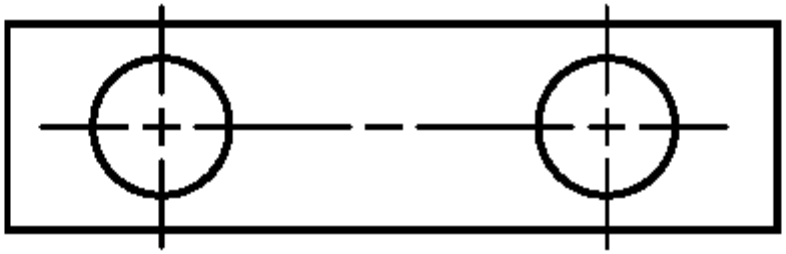
2. For concentric features, the centerline extends approximately 1/4" beyond the largest feature.



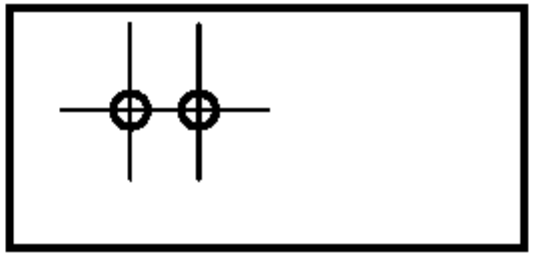
3. Omit centerlines on self-locating round corners and on fillets and rounds.

THE CENTER OF THE ARC IS SELF-LOCATING - .25 FROM THE TOP & RIGHT EDGES

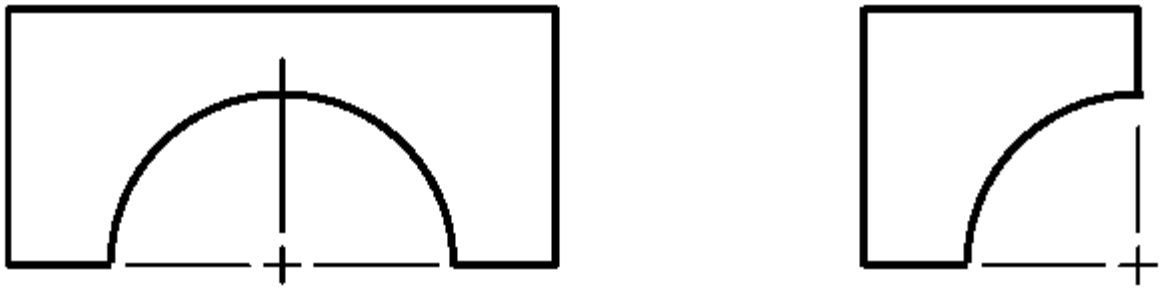
4. Join holes in a pattern with centerlines. Include a dash between holes following the rules for the center linetype if space permits.



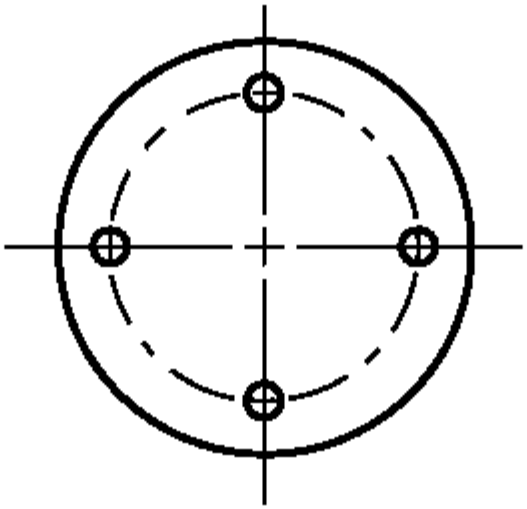
5. Do not include dashes in round views of holes or solid cylinders less than 3/16" diameter.



6. Show centerlines on circular cut features.



7. Use centerlines to indicate a bolt circle. A bolt circle represents the location of a round pattern of holes with respect to the center of the feature.



Precedence of Lines:

Often times in engineering graphics, an object line, hidden line, and centerline must coincide on a drawing. At this point, the issue of which one to show becomes important. Object lines always have precedence or cover up hidden and centerlines. Hidden lines have precedence over centerlines. In a view having coincident cutting plane and centerlines, the cutting plane line has precedence. See Figure 3.

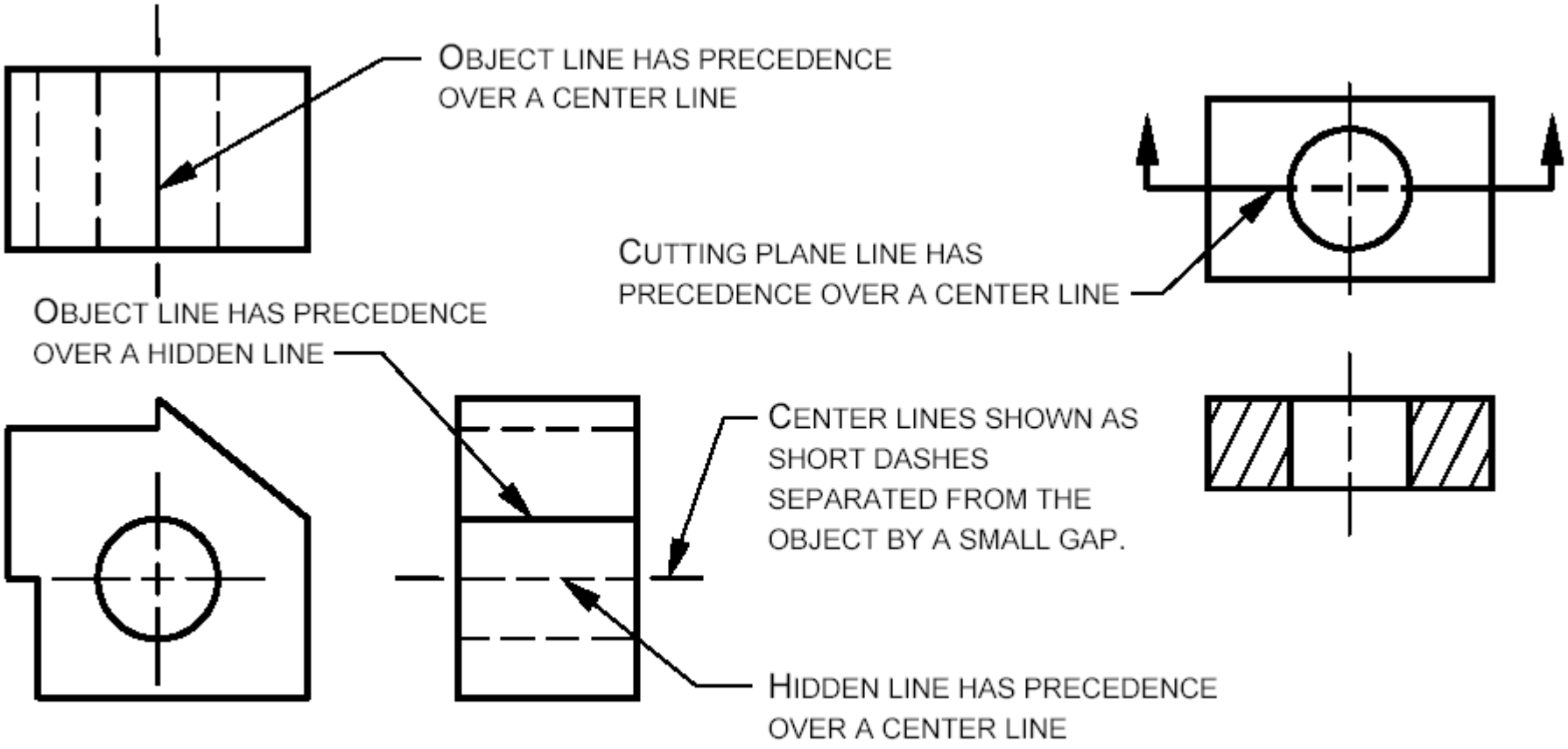


Figure 3: Precedence of Lines